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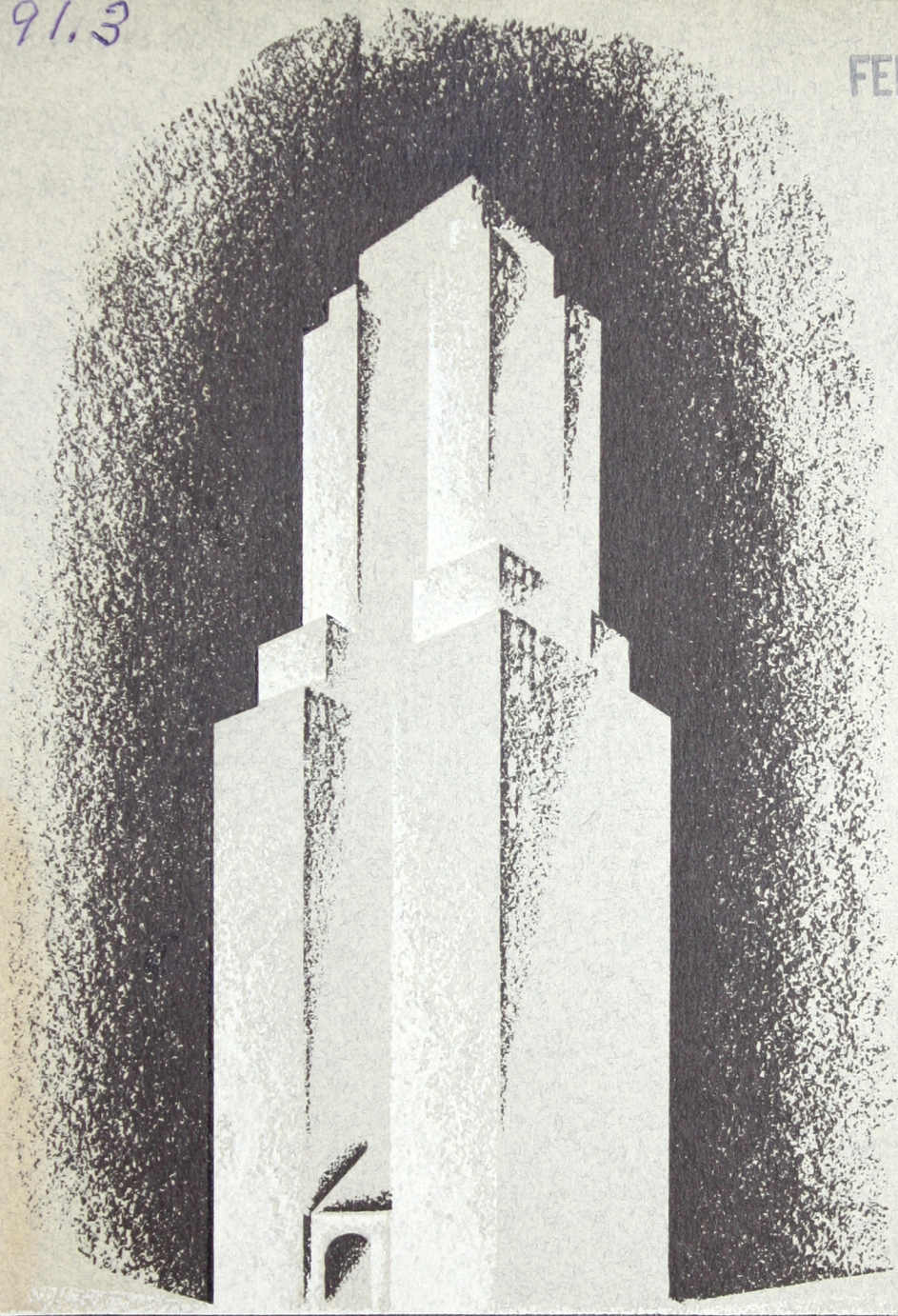


SOLVAY
CALCIUM CHLORIDE
in Concrete Construction

WM. L. RIDPATH & SONS
422 BULLETIN BLDG.
PHILADELPHIA

Contents

Solvay Calcium Chloride was a vital factor in the completion of the concrete work on structures illustrated in this booklet.

Benjamin Franklin Hotel, Philadelphia, Pa.
Contractors, John Gill & Sons, Cleveland, Ohio.
Architect, Horace Krombaar, Philadelphia, Pa.

OUTSTANDING among the great new achievements in concrete construction work are those which have been made possible through the use of Solvay Calcium Chloride.

By making concrete more workable, giving it great early strength and a quick set Solvay Calcium Chloride has won widespread usage in the building field.

It has made concrete construction in freezing weather a practical and profitable undertaking. The completion of many difficult tasks in the laying of concrete under severe handicaps has been made possible through its use.

With each new successful achievement much reliable data has been compiled. This data proves definitely that Calcium Chloride

is an absolute necessity for making the best and strongest concrete.

In the light of its present uses it stands as the most reliable method by which the concrete used for building construction can be satisfactorily cured.

The value of curing this type of concrete construction is now beginning to be fully appreciated by architects, engineers, and contractors. To further this end The Solvay Process Company has compiled the information embodied in this booklet.

Effects of Calcium Chloride on Concrete

EXHAUSTIVE experimental tests and the practical results obtained in many of the most impressive structures of the contemporary building period have proved conclusively that the benefits obtained through the use of Solvay Calcium Chloride with Portland cement are highly desirable to architect, builder and owner alike.

The character and dependability of these results have been definitely established. Tests made by the United States Bureau of Standards, The American Society for Testing Materials, The Portland Cement Association, The United States Engineers, The Solvay Process Company, and many other reliable authorities on concrete have left no room for doubt.

Detroit Free Press Bldg., Detroit, Mich.
Architect, Albert Kahn.
Contractors, Crowell & Little Const. Co.

The water-cement ratio is the most important factor determining the strength of concrete, according to data published by The Portland Cement Association.

It is generally agreed by all authorities, including this Association, that the best concrete is produced by a mix in which the proportion of gauging water is relatively low.

Ontario Government Building at the Canadian National Exposition in Toronto. *Architects*, Chapman and Oxley. *Contractors*, Sullivan and Fried.

Lower Water-Cement Ratio

WHEN Solvay Calcium Chloride is incorporated in the mix less water may be used to obtain the same degree of workability as concrete prepared under usual conditions. This means that the concrete can develop maximum strength by reason of its low water-cement ratio without sacrificing its workability.

One of the benefits of Solvay Calcium Chloride used integrally is the production of a fatty mix—one which hangs together and prevents the segregation of its components and which at the same time is more easily handled and is ideally adapted for chuting and conveying.

This is accomplished through an action which reveals one of its most important functions in the concrete mix—*it holds moisture uniformly throughout the concrete.* Through the same action it enables the concrete to retain this moisture during the curing period. This prevents shrinkage and causes the concrete to set to a more constant volume. (*Dr. F. Kellig, Zement, No. 45 to 48, 1922. C. R. Platzmann, Zement, Vol. 11, 1922. Dr. A. Guttmann, Director, Dusseldorf Cement Inst.*)

P. & A. Photo

The World-famous Building of the Chicago Tribune at Chicago, Illinois. *Architects*, Howells and Hood. *Contractors*, R. C. Wiedbolt Company for the Caissons and Foundation Work, Successfully Used Solvay Calcium Chloride in their Cement Work.

Greater Strength Through Proper Curing

IT is essential that moisture be furnished concrete to secure proper hydration of the cement, and insure maximum strength.

The tests which are tabulated in Figure 1 clearly illustrate the fact that properly cured concrete attains a degree of strength far greater than that of concrete which has not been furnished with the moisture necessary for hydration.

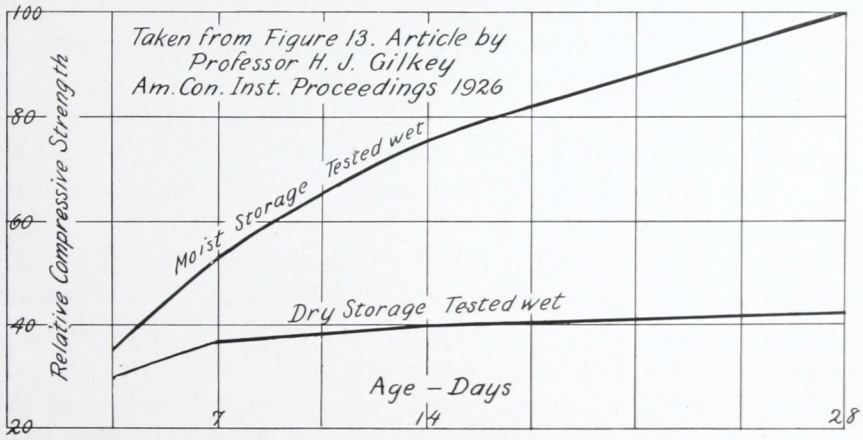
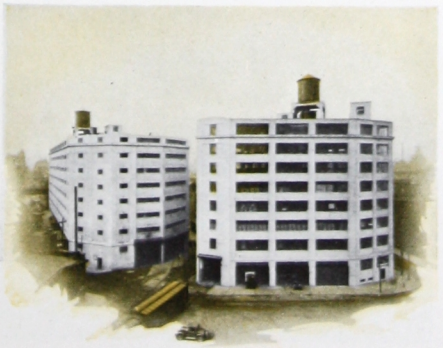


FIGURE 1—Curves showing relative increase in compressive strength gained through proper curing.

A distinct advantage in curing with Solvay Calcium Chloride as an admixture is that the curing proceeds uniformly throughout the entire thickness of the concrete. The distribution of moisture is maintained as though many minute sponges saturated with water were present in the concrete.

The importance of this curing method can readily be recognized since it offers a means of producing denser, stronger concrete which resists wear better.



Terminal Warehouse Co., Philadelphia, Pa. *Architects and Contractors*, Turner Construction Co.

Curing Concrete Used in Building Construction

THOSE concerned with building today have recognized the urgent need for some method of curing the concrete used in structures. Concrete is not finished until it is cured, and to date the cover methods of curing have not been found adaptable to structural concrete. The curing methods used on concrete pavements which require earth or straw coverings and constant sprinkling are impracticable for structures.

Solvay Calcium Chloride presents an ideal solution of this problem. Curing concrete with Calcium Chloride is not only an economical and direct method, but it also provides other benefits which alone would be sufficient to dictate its use.

The forms on concrete afford it some protection against premature drying out. This alone, however, is not sufficient to insure the amount of moisture which concrete must have to attain its maximum strength.

Structural conditions particularly during cool weather offer many obstacles to supplying this need by sprinkling. However, Solvay Calcium Chloride incorporated in the mix, supplies it readily by attracting and holding this needed moisture.

Complete hydration can then take place naturally and the concrete is enabled to obtain its full strength in much less than the usual time. To obtain the full strength from concrete laid during low temperatures, Calcium Chloride is a distinct necessity. During the warm months it offers an additional safeguard because it prevents the evaporation of the necessary moisture in the concrete.

Central High School Building, Johnstown, Pa.
Architect, E. L. Tilton, New York, N. Y.
Contractors, Berkebile Bros., Johnstown, Pa.

The American Furniture Mart at Chicago, Illinois. *Architect*, Henry Raeder. *Associates*, Geo. C. Nimmons & Company, and N. Max Dunning. *Builders*, Wells Brothers Construction Company.

Early Strength and Acceleration

IN addition to curing concrete properly, Solvay Calcium Chloride gives it far greater early strength and accelerates its hardening to a marked degree.

The most important effect of this acceleration is within the first few hours. To the builder it is especially significant that concrete pavements and floors cured with Solvay Calcium Chloride are hard enough to be walked on one hour after they are laid. Untreated concrete will generally require at least four hours to reach this point of hardness.

In this connection, attention is directed to the investigation carried on by Duff A. Abrams for the Portland Cement Association, as noted in his paper read before the American Society for Testing Materials. (*Proceedings A. S. T. M. 1924.*)

Table Rock House Under Construction. The Temporary Enclosure Protecting the Work is Entirely Covered by Frozen Spray from Niagara Falls.

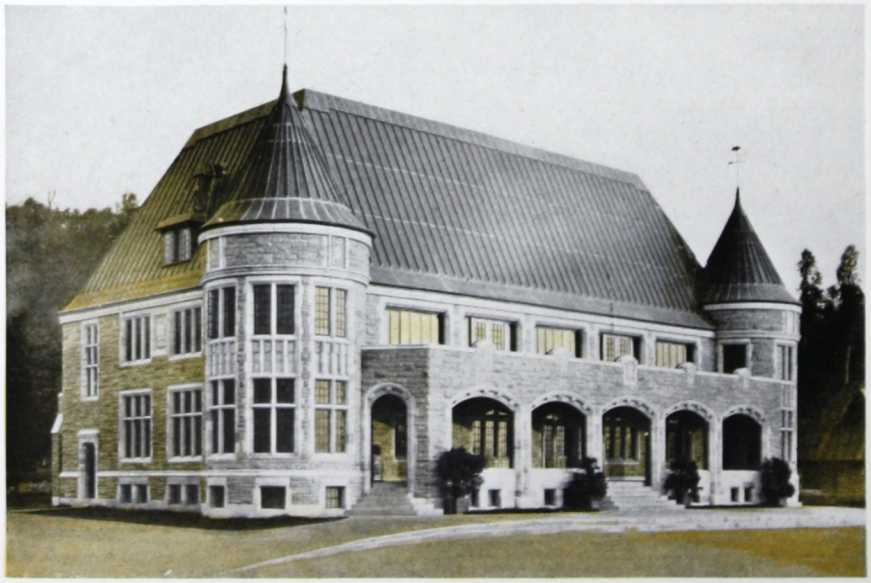


Table Rock House, Niagara Falls, Ontario. *Contractors*, Pigott-Healy Construction Co., Ltd., Hamilton, Ont.

After testing 7,500 compression specimens, Professor Abrams reported that Calcium Chloride produced an increase in concrete strength as indicated in the following table:

Comparative Strength Ratios

Concrete	*2 days*	*7 days*	*28 days*	*3 mo.*	*1 yr.*	*3 yrs.*
Untreated	100	100	100	100	100	100
Treated with 2 to 4% Calcium Chloride	170	125	110	112	117	118

Under average conditions, concrete that has been treated with the proper quantity of Calcium Chloride will attain at the end of 48 hours the strength equal to that of untreated concrete at the end of 7 days.

In order to attain maximum acceleration with the particular brand of cement used tests should be made to determine the proper amount of Calcium Chloride to be added per bag of cement.

Advantage of Early Strength

THE early strength secured by curing concrete with Solvay Calcium Chloride offers another distinct advantage which is not immediately obvious. Calcium Chloride improves the quality of the concrete because the early strength it produces enables the concrete to resist better the temperature and moisture changes which create considerable internal stress.

Then, too, the time saved by the use of the Solvay Calcium Chloride method of curing, results in a great economy in the use of forms, which can be removed in half the usual time.

Economies of this character must recommend the use of Solvay Calcium Chloride to the professions and trades concerned with modern concrete construction. And of greater consideration is the fact that besides saving time and equipment, Solvay Calcium Chloride is giving to concrete greater early strength and an additional factor of safety.

The Motor Mart Garage, in Boston, Outstanding Among its Type in the United States. *Architect,* Ralph H. Doane. *Builders,* Chase and Gilbert.

Lincoln Safe Deposit Company Building, New York.
Architect, George A. Kingsley. *Builders*, John Lowry, Inc.

Waterproofing

AS previously mentioned, Solvay Calcium Chloride holds moisture uniformly throughout the mass of concrete. For this reason the same degree of workability in concrete can be obtained with less water when Calcium Chloride is incorporated in the mix. The smaller proportion of mixing water produces concrete which is much denser and far more waterproof.

Early hydration of the cement particles resulting from the addition of Solvay Calcium Chloride to the mix, causes more complete hydration. This action enables the concrete to attain the density necessary for waterproofing qualities, even in its early stages.

Effects of Calcium Chloride on Reinforcing

THE incorporation of Calcium Chloride in Portland Cement concrete does not cause the corrosion of reinforcing steel. This has been established by data collected over a long period of years during which a careful study was made of this problem. The consistency of the mix and the manner in which the concrete is worked around the reinforcing are the vital factors in the cause and prevention of such corrosion.

Such an authority as Mr. J. C. Pearson, former physicist of the Bureau of Standards, stated in a discussion before the American Society for Testing Materials (*Proceedings A. S. T. M. 1923, pages 327-328*) concerning reinforcing steel in six-year old concrete test specimens containing Calcium Chloride:—

"The majority of people would pass upon them (steel rods) as being entirely satisfactory. In the case of the specimens buried in concrete, corrosion is absent over the greater portion of the surface of the rods, what rust occurred being localized apparently where voids occurred on the surface of the steel. Comparisons of the one-year and five-year specimens indicate that corrosion is not progressive."

Tests conducted by the Canada Cement Company, Limited, with test specimens of 1-2-4 concrete and 1-3 and 1-4 cement mortar in which reinforcing steel had been embedded, reveal that Calcium Chloride incorporated in the concrete mix does not cause corrosion of the steel.

"Corrosion," the company states, "was found only on the steel embedded in the dry mix. None was found in the mortar mixed to 125% consistency, which is about the usual consistency used in the construction of reinforced concrete."

The State of Pennsylvania has built concrete roads which contained 2% and 4% of Calcium Chloride incorporated in the mix. After seven years of service an examination of the mesh reinforcing used in them revealed no evidence of corrosion.

Thayer Hotel, West Point, N. Y.
Builders, John Lowry, Inc.
Architects, Caughey & Evans.

December 30, 1926.

January 27, 1927.

A Practical Demonstration of the Value of Solvay Calcium Chloride under Severe Conditions

MONTREAL RAIL AND WATER TERMINALS WAREHOUSE PROJECT

A. C. HAMMOND, District Manager, Parklap, Inc., in an article published in "Municipal Improvements" for June, 1927, makes the following statements.

"The Montreal Rail and Water Terminals Warehouse is a ten story reinforced concrete building with about 600,000 square feet of floor space. The contract for this building was signed September 16th, 1926, and occupancy of half the building was required June 1, 1927.

"This made the job a winter weather job and made it necessary to pour concrete without interruption all through the winter. The half of the building which was required on June 1st was rushed so that the roof was poured on January 28th, 1927.

"The area of this section was about 25,000 square feet on each floor. About 12,000 yards of concrete were poured under very severe weather conditions. The thermometer in Montreal ranges from freezing to 15° below zero, during the months of December and January.

"Calcium chloride was used in the proportion of two pounds to each sack of cement. Salamanders and canvas were left in place 48 hours or until necessary to start some work on the floor above. Removal of forms was started 48 hours after concrete was poured.

"No concrete was frozen. Progress was made at the rate of one floor every eight days. The quality of the work is as good as work done in summer weather. Unit costs of the work have been less than the unit costs on a similar job performed last summer provided the cost of winter weather protection is disregarded."

A test was made on this job with the following results:

Temp. Start—Plus 7°. Temp. Finish—Plus 17°	*Without Calcium*	*With 2% Calcium*
First crystals started	40 min.	1 hr. 40 min.
Surface stiffening	55 min.	2 hrs. 10 min.
Frozen ¼″ thick		No.
Frozen 1″ thick		No.
Frozen	4 hrs. 40 min.	No.
Start setting	Never	3 hrs. 10 min.
Set solid	Never	4 hrs. 25 min.

May 4, 1927.

Completed October 10, 1927.

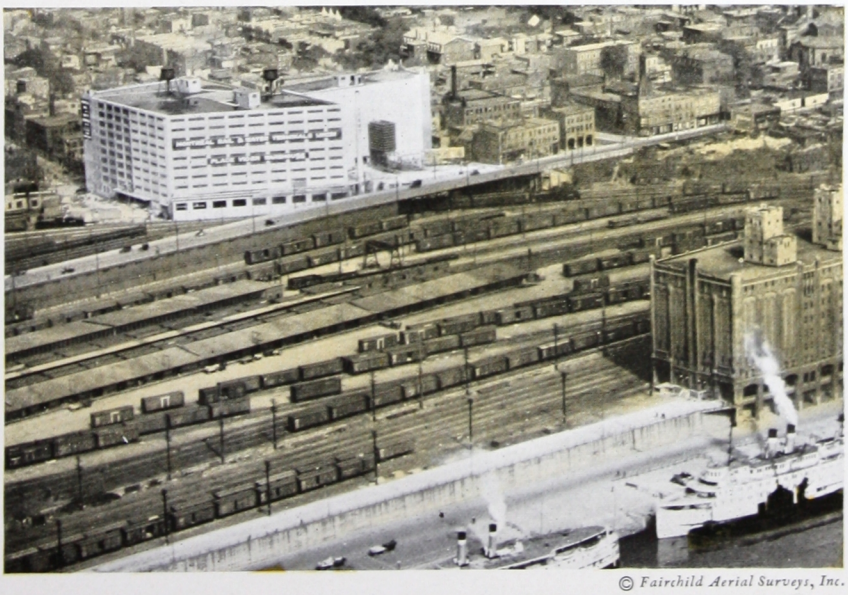
In his letter of September 7, 1927, to Solvay Sales Corporation, Mr. Hammond states:

"The value of calcium chloride is two-fold. It increases the speed of setting and delays the time of freezing. The saving effected by using calcium chloride consists of less time of cement finishers, less amount of canvas necessary, less time for burning coke in the salamanders, and earlier completion of the work, and more important than these—the lower cost of forms, steel and concrete on account of the earlier stripping. It decreases the time lost between the different operations and increases the efficiency of the cement.

"The Solvay Calcium Chloride was entirely satisfactory."

Very truly yours,

PARKLAP INCORPORATED.



© *Fairchild Aerial Surveys, Inc.*

Aerial View of Montreal Rail & Water Terminals, Ltd.
Architect, Chas. H. Moores. *General Contractors,* Parklap, Inc.

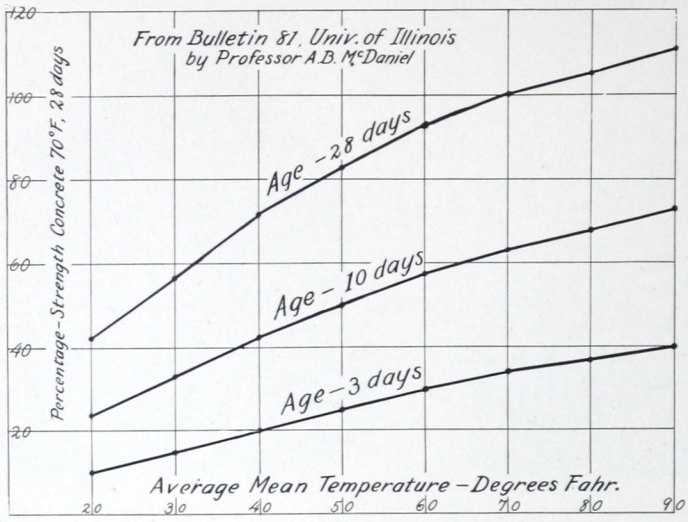


FIGURE 2

Curves showing percentage of 28 day strength (at 70° F.) attained by concrete poured at various temperatures.

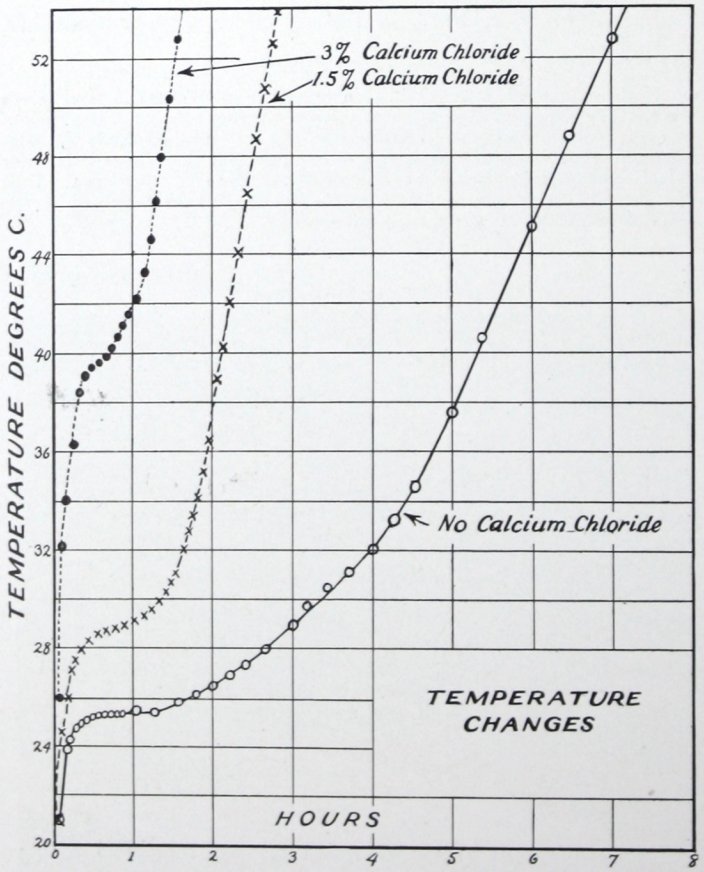


FIGURE 3

Curves showing relative increase in internal temperature caused by addition of Calcium Chloride to concrete (by John R. Baylis, Filtration Engineer, Chicago, in "Concrete," August, 1927)

Effect of Temperature on Strength of Concrete

THE damaging effects on concrete caused by exposure to low temperatures during the curing period have long been recognized, but the importance of protecting concrete from low temperatures is even today too often disregarded. (Fig. 2, see page 18).

A. R. Lord, in his notes on "Wacker Drive," (*A. C. I. Proceedings, 1927, p. 59-61,*) states: "We found on Wacker Drive that one degree change in temperature was roughly equal to 50 pounds per square inch change in strength at 28 days.

"As between 75 degrees average 28 day temperature (July) and 55 degrees (May and October) this means a loss of 1,000 pounds per square inch in strength.

"No precautions are ordinarily taken in the field at this time of the year and yet here is a variation in strength equal to a change of .15 in the water cement ratio or of 1 gallon of water per sack of cement.

"Furthermore, our 6 and 12-month tests, while too few in number to be at all conclusive, indicate that concrete placed under cool temperatures in April and May never catches up with that placed under midsummer temperatures."

However, the dangers of laying concrete during cold weather can to a great measure be avoided by the use of Solvay Calcium Chloride.

Calcium Chloride incorporated in the mix accelerates the setting of the concrete and increases the internal temperature of the mass (Fig. 3, see page 18), which is a large factor in maintaining the proper temperature during the curing period.

Maccabees Building, Detroit, Mich.
Architect, Albert Kahn, Inc.
Contractors, H. J. Christman Co.

Bankers Building, Clark & Adams Street, Chicago, Ill.
General Contractors, Dieks Construction Co.
Architect, D. H. Burnham.

Use of Calcium Chloride in Cold Weather

CALCIUM Chloride is now considered a necessity for concrete work which is to be completed during the winter months. Ordinary conditions have involved so many difficulties in cold weather that Calcium Chloride has gained recognition as an important factor in the solution of the cold weather problem.

In "Concrete Highway Magazine" for November, 1924, the following statement appears: "The only chemical recommended for addition to the mixing water is Calcium Chloride. This material possesses the property of lowering the freezing point of the water and accelerating the setting of the concrete. It is used by being dissolved in the mixing water. It is generally sold in crystalline form and is readily soluble in water."

At the same time the usual precautions must be taken to be certain of positive protection. The use of salamanders and the heating of aggregate materials should not be neglected when concrete is placed at temperatures near freezing.

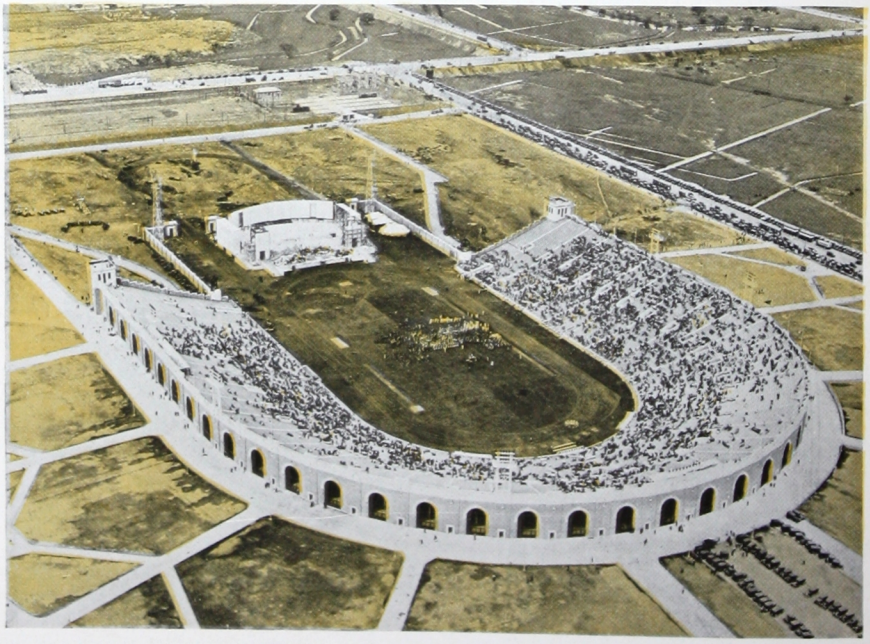
The Portland Cement Association, in a booklet entitled, "Precautions for Concrete Pavement Construction in Cold Weather," under the section headed, "Use of Calcium Chloride and Similar Compounds in Cold Weather Construction," submits the following information: "Within certain limitations Calcium Chloride or Calcium Oxychloride may be used in Portland Cement mixtures to hasten hardening and to increase early strengths.

"The amount of the admixture required to produce the most beneficial effect seems to be dependent upon the Chlorine content. Only small amounts of the admixtures may be used to advantage.

"The greatest acceleration is obtained with 2 to 4 percent of Calcium Chloride or 7 to 10 percent of Calcium

University Club, Boston, Mass.
Architects, Monles & Johnson.
Builders, W. A. & H. A. Root.

Detroit Railway and Harbor Terminal.
Architect, Albert Kahn. *Contractors*, Parklap, Inc.



The Sesqui-Centennial Stadium at Philadelphia.
Contractors, Turner Construction Co. *Architect*, Simon & Simon.

Oxychloride by weight of the cement. With these percentages, tests covering a period of three years show no indications of reduced strength. If quantities of these materials greater than the above amounts are employed, the strength decreases.

"When these compounds are used in cold weather work, they should not be used as a substitute for heating the materials and furnishing proper protection and heat to the finished structure, but only as an added precaution and as a means of shortening the curing period."

When Solvay Calcium Chloride is used in the mix, it is not necessary to provide this protection for so long a time as when plain concrete is used. It can easily be seen that when it is possible to gain sufficient strength in half ordinary time, both the cost of protection and the time of greatest hazard also are reduced by half.

Experiments along these lines are reported by M. Anstett, in Pit and Quarry, August 31st, 1927, as follows: "Mortars having Calcium Chloride incorporated that were exposed to a temperature of 68 degrees Fahrenheit all gave remarkably high mechanical resistance, while when they were made with the addition of pure water, their resistance was almost nil, which agrees with the results that were obtained in former experiments. The use of Calcium Chloride may therefore be held to be of great importance in the preparation of mortars during the cold months of the year."

To make certain these results are obtained, specimens subjected to the same curing conditions as the mass of concrete should be made and tested in the field.

This is highly advisable because the neglect of proper precautions in protecting concrete against cold can nullify much of the effort which is made to obtain high strength in concrete by use of Solvay Calcium Chloride.

The Salvador Rodriguez Memorial Building at Tampa, Florida.

Elverson Building, Home of Philadelphia "Inquirer," Philadelphia, Pa. *Architect*, Rankin, Kellogg & Crane, Philadelphia, Pa. *Contractor*, Roydhouse & Arey.

Solvay Calcium Chloride in Various Types of Concrete Construction

MANY of the foregoing conclusions have already suggested the value of Solvay Calcium Chloride in specialized types of concrete construction work. Its value as an admixture in cement mortar has been demonstrated by many of the results of experiments here noted in connection with concrete.

In poured concrete work too, it has been demonstrated that the quick setting and greater strength produced through the use of Solvay Calcium Chloride are of inestimable value. In further addition to the benefits previously discussed, Solvay offers many special advantages in the construction of floors, walks, and other work requiring cement finishing.

The use of Solvay Calcium Chloride increases the cementing qualities as well as the tensile and compressive strength of concrete. Its action at once hardens and densifies the concrete and so increases its resistance to dusting.

Since concrete or cement mortar cured with Solvay Calcium Chloride will absorb considerably less water than that gauged with water alone, the concrete so produced reveals less porosity. It resists wear better and also shows a greater resistance against acids and alkalies.

Solvay Calcium Chloride makes the concrete or cement mortar more workable and plastic. This so-called "fatty" mix promotes quicker work and easier troweling. As a result the particles are cemented together, producing a smooth surface which is much more waterproof than one obtained with untreated concrete.

These qualities are highly desirable for the construction of concrete chimneys, sidewalks and the concrete floors of buildings, especially for factories, warehouses, garages, etc. The use of Solvay Calcium Chloride materially eliminates overtime and cuts down the usual period of delay experi-

Wardell Apartment Hotel, Detroit, Mich. *Architects*, Weston-Ellington. *Contractor*, Bryant Detwiler.

The Park Square Building, Boston, Mass. *Architects,* Densmore, LeClear and Robbins. *Builders,* W. A. and H. A. Root.

enced before placing the work in service and decreases maintenance expense by prolonging the life of floor surfaces.

On the Park Square Building, Boston, Mass., the use of Solvay Calcium Chloride saved the contractors over $6,000 in the elimination of overtime on floor finishing alone. The hardness of the surface of finished concrete which has been mixed with Solvay is also characteristic of the entire thickness of the mass, because when Solvay Calcium Chloride is used integrally it cures the concrete uniformly throughout.

Concrete Products — Blocks, Bricks, Pipes, Piles, Details, and Precast Work

IN THE manufacture of concrete products Solvay Calcium Chloride offers curing methods which tests have proved far more effective than anything yet discovered in this field.

Many plants manufacturing these articles have been using steam as a curing agent. Experiments now reveal that equal results at lower cost can be obtained through the use of Calcium Chloride alone and that almost unbelievable speed and dependability in curing can be obtained where steam and Calcium Chloride are used in combination.

At the Watertown Arsenal, tests were made on concrete brick

manufactured in the plant of the Bay State Brick and Stone Company, of Haverhill, Mass. These tests showed that at the end of 7 days, the brick cured by the addition of 2% Calcium Chloride had gained even greater strength than those cured with steam alone.

Results obtained by the Tebaldi Supply Company, of Indian Orchard, Mass., and the Springfield Sand and Tile Company, Springfield, Mass., reveal that blocks cured with steam and Calcium Chloride used together reached a compressive strength of over 1,000 pounds in 24 hours!

Results of tests made at the Testing Laboratories of the City of Springfield, on blocks produced by the Springfield Sand and Tile Company, are tabulated below.

Curing Method	*Age 24 hours Pounds per Square Inch*	*Age 48 hours Pounds per Square Inch*	*Age 72 hours Pounds per Square Inch*	*Age 7 days Pounds per Square Inch*
2% Calcium Chloride alone . . .	246	341	482	808
Steam alone 24 hours	319	556	537	580
2% Calcium Chloride and Steam 24 hours .	781	952	1015	1098

The strength computed in the above table is based on the gross area of the blocks. The net area of the blocks was approximately one-half of the gross area. The compressive strength therefore, based on the net bearing surface, was double these figures.

Canadian Rail and Harbour Terminals, Limited, Toronto.
Architect, Charles H. Moores. *General Contractors*, Parklap, Inc.

The Verendrye Bridge at Sanish, North Dakota. Beginning of the Work of Spanning the Frozen Missouri River in Mid-Winter.

Verendrye Bridge Completed. (Solvay Calcium Chloride was an Important Factor in Constructing the Concrete Piers.) Built by Minneapolis Bridge Co.

Directions for Using Solvay Calcium Chloride

THE directions for using Solvay Calcium Chloride are so simple that it is possible to have the work of mixing done by ordinary labor.

The Calcium Chloride should be added to the mix in solution form. A standard Solvay Calcium Chloride solution is a convenient one for assuring accurate and uniform addition of the desired quantity of Calcium Chloride.

Standard Calcium Chloride Solution

TO PREPARE a standard solution of Solvay Calcium Chloride, fill a 50 gallon barrel about two-thirds full of water and put in 200 pounds of Solvay Calcium Chloride, stir until the Calcium Chloride is thoroughly dissolved. Then add enough water to fill up the barrel. This will produce 50 gallons of a standard solution containing 4 pounds of Calcium Chloride per gallon, or 1 pound per quart.

Adding Calcium Chloride to the Mix

AFTER the solution has been prepared, mix the batch of concrete or cement mortar in the usual way except that for each bag of cement used, add the necessary amount of Solvay Calcium Chloride solution with the gauging water, which should be cut down by a volume at least equal to that of the Calcium Chloride solution added.

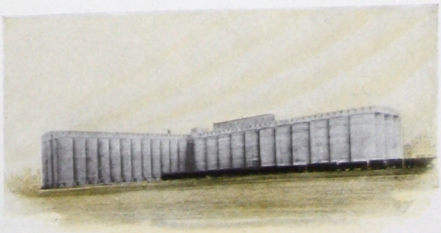
Quantity to Use

IT HAS usually proved most satisfactory and convenient to use the quantity of cement in the mix as the basis for determining the necessary amount of Solvay Calcium Chloride to be added.

Two pounds of Solvay Calcium Chloride per bag of cement have proved sufficient to effect proper curing under average conditions with various brands of cement. The amount actually required on a job will vary slightly, depending on prevailing conditions, such as temperature, humidity, location, kind of mix, etc.

To determine maximum acceleration which can be obtained with any particular brand of cement, test specimens containing various amounts of Solvay Calcium Chloride should be prepared and tested under actual field conditions. The quantity of Calcium Chloride to be used can be readily determined from a comparison of the strengths attained.

Not more than 4 pounds nor less than 1 pound of Calcium Chloride per bag of cement should be used to derive maximum benefit.



Grain Tanks of Santa Fe Elevator
Near Argentine, Kansas.
Constructed by John S. Metcalf Co.

Cost

CONSIDERING the advantages and saving it effects for the contractor, Solvay Calcium Chloride is negligible in cost. At the average quantity of 2 pounds per bag of cement, the added cost of using it will amount to from three to five cents per bag of cement east of the Mississippi, depending on quantity purchased and shipping point. In the West, the cost is slightly higher.

Shipment

SOLVAY Calcium Chloride is shipped in non-returnable metal drums for which no additional charge is made. These standard drums contain 375 pounds net each. It is also shipped in moisture-proof, paper-lined, burlap bags, containing 100 pounds each. Solvay Calcium Chloride in bags requires the same weather protection as cement. The ease of handling the bags makes this container very attractive to many customers.

Solvay Calcium Chloride is carried in stock in more than 75 warehouses in the United States, which insures prompt delivery with minimum transportation charges. For carload shipments direct from the plant the Traffic Department of the Company is especially equipped and prepared to facilitate delivery safely and economically.

Technical Service

IT IS quite natural that in special instances unusual problems will arise relative to the use of Solvay Calcium Chloride. Although this booklet represents an attempt to give complete information, exceptional conditions may demand special treatment.

To meet such emergencies, Solvay Sales Corporation desires that architects, engineers, and contractors avail themselves of the facilities of its Technical Service Department. This service is gratis and is gladly extended in the interests of Better Concrete Construction.

Syracuse, New York, Plant of The Solvay Process Company.

Specifications

THE following are the correct specifications for using Solvay Calcium Chloride in Portland Cement concrete construction work.

QUANTITY: The Calcium Chloride shall be added in solution to the mix in the proportion of two pounds of Calcium Chloride per bag of cement; or, when maximum acceleration is desired, in an amount found satisfactory by tests and specified by the Engineer. In cold weather this amount may be increased, but not in excess of four pounds of Calcium Chloride to each bag of cement. In rich mixes, and in extremely warm weather, it may be found desirable to reduce the amount to one pound of Calcium Chloride for each bag of cement. In every case be prepared to find that the cement sets more quickly than in plain concrete.

WATER: The water content shall be kept as low as possible and still permit a workable concrete. Calcium Chloride is more effective in a mix containing just enough water to make it workable, than in a mix containing more water.

CALCIUM CHLORIDE SOLUTION: This solution which is to be added to the mix shall contain four pounds of Calcium Chloride per gallon of solution. It shall be made up by filling a fifty gallon barrel about two-thirds full of water, to which add two hundred pounds (two bags) of flake Calcium Chloride and stir until the Calcium is all dissolved.

Add enough more water to fill the fifty gallon barrel and stir to make the solution uniform throughout. The fifty gallons of solution will then contain four pounds of Calcium Chloride per gallon or one pound per quart.

ADDING CALCIUM CHLORIDE TO THE MIX: If for every bag of cement put in the mix, two pounds of Calcium Chloride per bag of cement are specified, add two quarts of the standard Calcium Chloride solution for each bag of cement. This solution, containing one pound of Calcium Chloride to each quart, must be added as part of the gauging water.

The Calcium Chloride solution should not come into contact with the cement until it enters the mixer drum. The Calcium Chloride solution must be figured as part of the mixing water in computing the water-cement ratio. The mixing water generally required should be reduced by an amount at least equal to the quantity of standard Calcium Chloride solution which is added.

The materials, after being placed in the mixer drum, should be very thoroughly mixed to insure uniform distribution of the Calcium Chloride.

Thorough mixing also makes the concrete more workable, and gives it greater strength. The usual time specified for mixing ordinary concrete in a mixer is one minute. Tests show that the strength may be increased as much as 10% by mixing one and one-half minutes, instead of one minute.

PROTECTION: Calcium Chloride is also a valuable adjunct to concrete for cold weather work. It not only reduces the freezing point of water, but its accelerating action generates additional heat which reduces considerably the time usually required for protecting concrete, and is an added factor of safety.

The usual precautions, such as heating the aggregate and water, and covering, or otherwise protecting the concrete, should be strictly observed in cold weather work.

CALCIUM CHLORIDE: This material shall be that manufactured by The Solvay Process Company, or a product of equal quality. It shall contain 77/80% pure anhydrous Calcium Chloride and shall be free from Magnesium Chloride. It shall be packed in moisture proof bags, or in airtight drums, and shall be in the flake form. When tested by means of laboratory screens, it shall meet the following requirements:

Through ⅜ in. mesh screen	100%
Through 20 in. mesh screen, not more than	10%

SOLVAY SALES CORPORATION

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